Upper Middle Miocene Fan 1 (MM9 F1) Play

Textularia "W" and *Bigenerina* 2 biozones

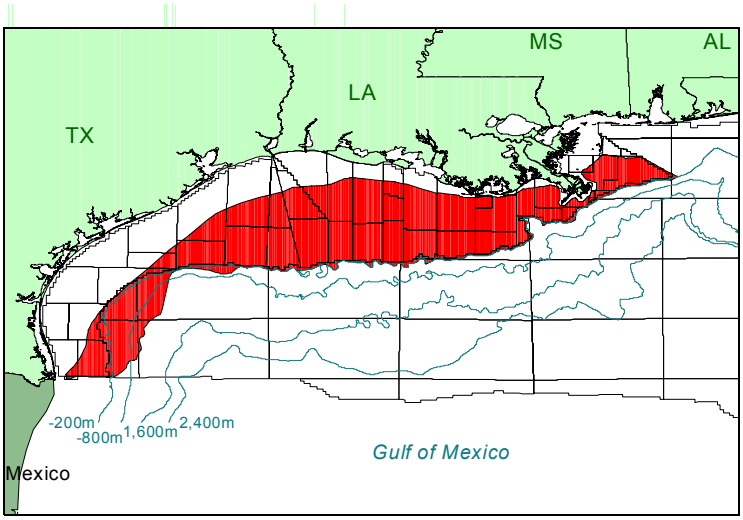

Figure 1. Play location.

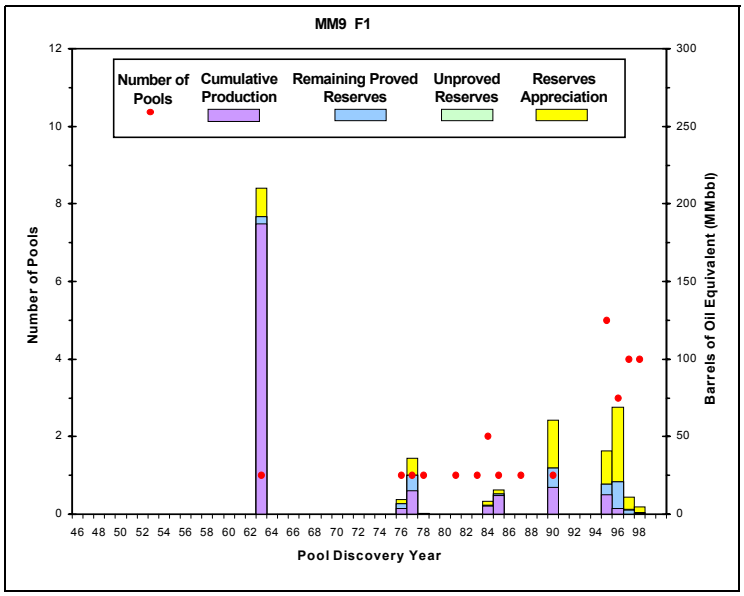

Figure 2. Exploration history graph showing reserves addition and number of pool discoveries by year.

MM9 F1 Play 27 Pools 63 Sands	Minimum	Mean	Maximum
Water depth (feet)	15	154	399
Subsea depth (feet)	7950	11016	18350
Number of sands per pool	1	2	11
Porosity	19%	26%	30%
Water saturation	20%	37%	54%

Table 1. Pool attributes. Values are volume-weighted averages of individual reservoir attributes.

Play Description

The established Upper Middle Miocene Fan 1 (MM9 F1) play occurs within the *Textularia* "W" and *Bigenerina* 2 biozones. The play is also defined by deep-sea fan sediments in an extensional structural regime of salt-withdrawal basins and extensive listric faulting located on the modern Gulf of Mexico Region shelf. The MM9 F1 play extends from the South Padre Island and Port Isabel Areas offshore Texas to Main Pass Area east of the present-day Mississippi River Delta (figure 1).

Updip, the MM9 F1 play is bounded by the shelf/slope break associated with the *Textularia "W"* biozone and grades into the deposits of the Upper Middle Miocene Progradational (MM9 P1) play. To the northeast, the MM9 F1 play's boundary is the Upper Middle Miocene Aggradational/Progradational (MM9 AP1) play overlying the Cretaceous carbonate shelf. To the southwest, the play extends into Mexican national waters. Downdip, the MM9 F1 play is limited by the Upper Middle Miocene Fan 2 (MM9 F2) play.

Play Characteristics

The MM9 F1 play is characterized by deepwater turbidites deposited basinward of the MM9 shelf margin. Component depositional facies include channel/levee complexes, sheet-sand lobes, interlobes, lobe fringes, and slumps deposited on the upper and lower slope, in topographically low areas between salt structure highs, and on the abyssal plain. These deep-sea fan systems are often overlain by thick shale intervals representative of zones of sand bypass on the shelf, or sand-poor zones on the slope.

Many of the fields in the MM9 F1 play are associated with permeability barriers, updip pinchouts or facies changes, and salt diapirs with

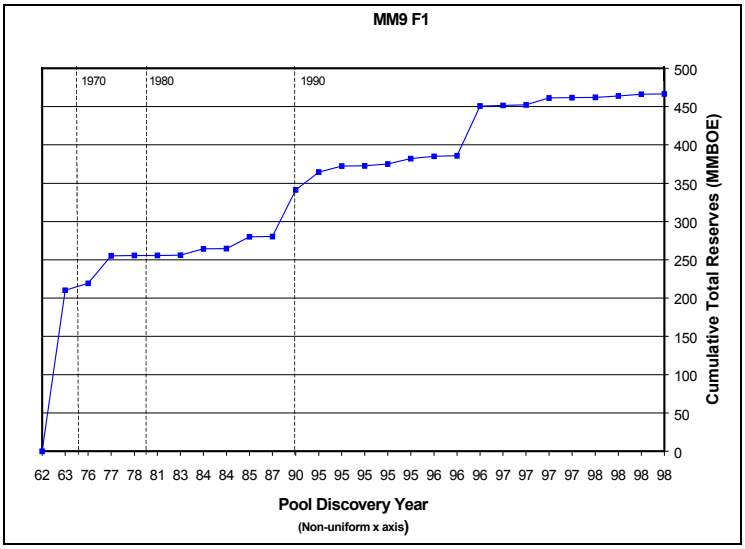

Figure 3. Plot of pools showing cumulative reserves by discovery order. Note the non-uniform x axis.

MM9 F1 Play Marginal Probability = 1.00	Number of Pools	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)
Reserves				
Original proved	23	0.161	0.873	0.317
Cumulative production	--	0.148	0.620	0.258
Remaining proved	--	0.013	0.253	0.058
Unproved	4	<0.001	0.003	0.001
Appreciation (P & U)	--	0.043	0.597	0.149
Undiscovered Conventionally Recoverable Resources				
95th percentile	--	0.057	1.920	0.418
Mean	53	0.092	2.611	0.556
5th percentile	--	0.135	3.360	0.708
Total Endowment				
95th percentile	--	0.262	3.392	0.885
Mean	80	0.297	4.083	1.023
5th percentile	--	0.340	4.832	1.175

Table 2. Assessment results for reserves, undiscovered conventionally recoverable resources, and total endowment.

hydrocarbons trapped on diapir flanks or in sediments draped over diapir tops. Less common trapping structures include normal faults and growth fault anticlines. Seals are provided by the juxtaposition of reservoir sands with shales and salt, either structurally (e.g., faulting, diapirism) or stratigraphically (e.g., lateral shale-outs, overlying shales).

Discoveries

The MM9 F1 mixed oil and gas play contains total reserves of 0.205 Bbo and 1.472 Tcfg (0.467 BBOE), of which 0.148 Bbo and 0.620 Tcfg (0.258 BBOE) have been produced. The play contains 63 producible sands in 27 pools of which 23 contain proved reserves (table 1; refer to the Methodology section for a discussion of reservoirs, sands, and pools). The first reserves in the play were discovered in the Main Pass 41 field in 1963 (figure 2). This field contains the largest pool in the play by far with 210 MMBOE in total reserves, which also accounts for the play's maximum yearly total reserves. Sixty percent of the play's total reserves and 87 percent of the play's cumulative production have come from pools discovered before 1990. The most recent discoveries, prior to this study's cutoff date of January 1, 1999, were in 1998.

The 27 discovered pools contain 103 reservoirs, of which 71 are nonassociated gas, 26 are undersaturated oil, and 6 are saturated oil. Cumulative production has consisted of 57 percent oil and 43 percent gas.

Assessment Results

The marginal probability of hydrocarbons for the MM9 F1 play is 1.00. The play has a mean total endowment of 0.297 Bbo and 4.083 Tcfg (1.023 BBOE) (table 2). Twenty-five percent of this BOE mean total endowment has been produced.

Assessment results indicate that undiscovered conventionally recoverable resources (UCRR) have a range of 0.057 to 0.135 Bbo and

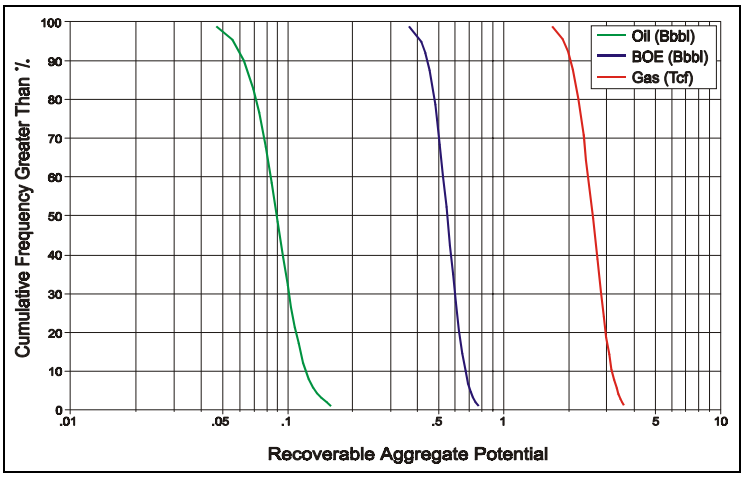

Figure 4. Cumulative probability distribution for undiscovered conventionally recoverable resources.

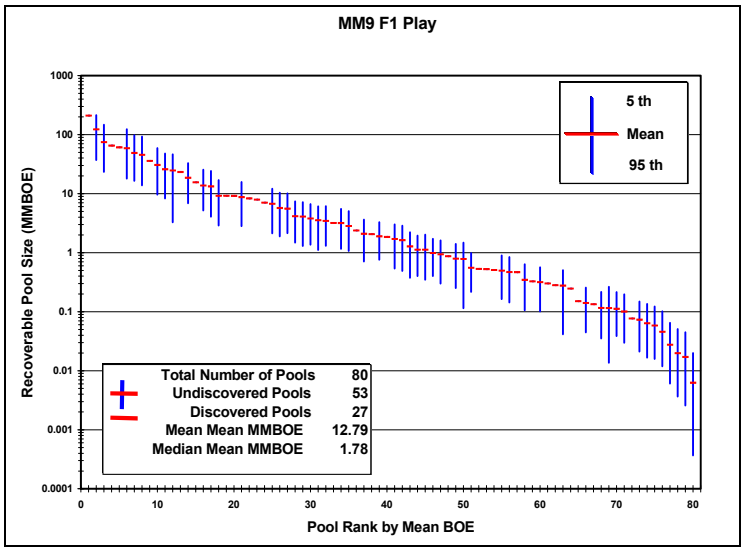

Figure 5. Pool rank plot showing the number of discovered pools (red lines) and the number of pools forecast as remaining to be discovered (blue bars).

1.920 to 3.360 Tcfg at the 95th and 5th percentiles, respectively (figure 4). Mean UCRR are estimated at 0.092 Bbo and 2.611 Tcfg (0.556 BBOE). These undiscovered resources might occur in as many as 53 pools. The largest undiscovered pool, with a mean size of 123 MMBOE, is forecast as the second largest pool in the play (figure 5). The forecast places the next four largest undiscovered pools in positions 3, 6, 7, and 8 on the pool rank plot. For all the undiscovered pools in the MM9 F1 play, the mean mean size is 11 MMBOE, which is smaller than the 17 MMBOE mean size of the discovered pools. The mean mean size for all pools, including both discovered and undiscovered, is 13 MMBOE.

The MM9 F1 is a relatively well explored play and BOE mean UCRR contribute over half of the play's BOE mean total endowment. Discoveries will continue to be made in structural and stratigraphic traps located around salt bodies and below salt sheets.